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PART VI

ENVIRONMENTAL PROTECTION AGENCY

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PESTICIDE PROGRAMS

Rebuttable Presumption Against Registration and Continued Registration of Pesticide Products Containing Pentachloronitrobenzene (PCNB)

[6560-01]

[FRL 805-4; OPP-30000/17]

ENVIRONMENTAL PROTECTION AGENCY

PESTICIDE PROGRAMS

Rebuttable Presumption Against Registration and Continued Registration of Pesticide Products Containing Pentachloronitrobenzene (PCNB)

AGENCY: Office of Pesticide Programs, Environmental Protection Agency (EPA).

ACTION: Notice of rebuttable presumption.

SUMMARY: Pentachloronitrobenzene (PCNB) has been found to exceed certain risk criteria. This notice requests registrants and other interested persons to submit rebuttals and other information on the presumption and to submit any other data on the risks and benefits of this pesticide chemical. This notice is the first of several which will give public notification of the Agency's progress in reviewing this chemical.

DATES: Rebuttal evidence and other information must be received on or before December 5, 1977. Address material to Federal Register Section, Technical Services Division (WH-569), Office of Pesticide Programs, EPA, Rm. 401, East Tower, 401 M St. SW., Washington, D.C. 20460.

FOR FURTHER INFORMATION CONTACT:

Jeff Kempter, Office of Special Pesticide Reviews, Office of Pesticide Programs (WH-566), Rm. 447, East Tower, EPA 202-755-8053.

SUPPLEMENTARY INFORMATION: The Deputy Assistant Administrator, Office of Pesticide Programs, EPA, has determined that a rebuttable presumption exists against registration and continued registration of all pesticide products containing PCNB.[1]

I. Regulatory Provisions

A. *General.* Title 40, Part 162.11, of the Code of Federal Regulations for the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) as amended (86 Stat. 973, 89 Stat. 751, 7 U.S.C. 136 et seq.), provides that a rebuttable presumption against registration shall arise if the Agency determines that a pesticide meets or exceeds any of the risk criteria relating to acute and chronic toxic effects set forth in § 162.11(a)(3). If it is determined that such a rebuttable presumption has arisen, the regulations require that the registrant be notified by certified mail and afforded an opportunity to submit evidence in rebuttal of the presumption. In addition, the Agency has determined that the public should also be given notice of the bases for the presumption to provide an opportunity for comment and to solicit additional information relevant to the presumption.

A notice of rebuttable presumption against registration is issued when the evidence related to risk meets the criteria set forth in § 162.11(a)(3). It is emphasized that a notice of rebuttable presumption against registration and continued registration of a pesticide is not a notice of intent to cancel the registration of a pesticide, and may or may not lead to cancellation. The notice of intent to cancel is issued only after the risks and benefits of a pesticide are carefully considered and it is determined that the pesticide may generally cause unreasonable adverse effects to the environment.

Accordingly, all registrants and applicants for registration are invited pursuant to 40 CFR 162.11(a)(4) to submit evidence in rebuttal of the presumptions listed in Part II of this notice and, in the case of oncogenicity, to submit information which relates to the assessment of oncogenic risks as set forth in the Agency's Interim Procedures and Guidelines for Health Risk and Economic Impact Assessment of Suspected Carcinogens (May 25, 1976; 41 FR 21402). Registrants and other interested parties may submit for consideration data on benefits which they believe would justify registration or continued registration. In addition, any registrant may petition the Agency to voluntarily cancel a current registration pursuant to Section 6(a)(1) of FIFRA.

This notice of rebuttable presumption against PCNB also describes scientific studies which suggest that hexachlorobenbene (HCB), a contaminant of PCNB, may adversely induce oncogenic and/or reproductive effects. The Agency is soliciting information and comment on these questions, but is not now presuming against HCB on the basis of these studies.

B. *Rebuttal Criteria.* Section 162.11(a)(4) provides that a registrant may rebut the presumption by sustaining the burden of proving:

(1) In the case of a pesticide presumed against pursuant to the acute toxicity or lack of emergency treatment criteria, "that when considered with the formulation, packaging, method of use, and proposed restrictions on the directions for use and widespread and commonly recognized practices of use, the anticipated exposure to an applicator or user and to local, regional, or national populations of nontarget organisms is not likely to result in any significant acute adverse effects" (40 CFR 162.11(a)(4)(i));

(2) In the case of a pesticide presumed against pursuant to the chronic toxicity criteria, "that when considered with proposed restrictions on use and widespread and commonly recognized practices of use, the pesticide will not concentrate, persist or accrue to levels in man or the environment likely to result in any significant chronic adverse effects" (40 CFR 162.11(a)(4)(ii); or

(3) In either case, that "the determination by the Agency that the pesticide meets or exceeds any of the criteria for risk was in error" (40 CFR 162.11(a)(4)(iii)).

C. *Benefits Information.* In addition to submitting evidence to rebut the presumption of risk, section 162.11(a)(5)(iii) provides that a registrant "may submit evidence as to whether the economic, social and environmental benefits of the use of the pesticide subject to the presumption outweigh the risk of use." If the risk presumptions are not rebutted, the benefit evidence submitted by the registrant,[2] applicants, and other interested persons will be considered by the Administrator in determining the appropriate regulatory action. Specifically § 162.11(a)(5)(iii) provides that if the benefits appear to outweigh the risks, the Administrator may in his discretion, issue a notice of intent to hold a hearing pursuant to section 6(b)(2) of FIFRA to determine whether the registration should be cancelled or application denied. Alternatively, if the "benefits do not appear to outweigh the risks, the Administrator shall issue a notice pursuant to section 3(c)(6) or section 6(b)(1) of the Act, as appropriate." Moreover, if at any time the Administrator determines that a pesticide poses an "imminent hazard" to humans or the environment, a notice of suspension may be issued pursuant to section 6(c) of the Act.

Stated below are the § 162.11(a)(3) risk criteria which the Agency has found to have been met or exceeded by registrations and applications for registration of pesticide products containing PCNB. The Agency's basis for concluding that these risk criteria have been met or exceeded is set out in "Pentachloronitrobenzene (PCNB): Position Document 1," which follows. Copies of attachments to the Position Document, which are not published with this notice, are available for public inspection in the Office of Special Pesticide Reviews. Information protected from disclosure pursuant to

[1] A position document, containing an appendix of references, background information, and other material pertinent to the issuance of this notice, has been prepared by the Agency Working Group on PCNB and is also published with this notice.

[2] Registrants or other interested persons who desire to submit benefit information should consider submitting information on the following subjects, along with any other relevant information they desire to submit:

1. Identification of the major uses of the pesticide, including estimated quantities used by crop or other application.
2. Identification of the minor uses of the pesticide, including estimated quantities used by category such as lawn and garden uses and household uses.
3. Identification of registered alternative products for the uses set forth in (1) and (2) above, including an estimate of their availability.
4. Determination of the change in costs to the user of providing equivalent pesticide treatment with any available substitute products.
5. Assessment of regulation impact upon user productivity (e.g., yield per acre and/or total output) from using available substitute pesticides or from using no other pesticides.
6. If the impacts upon either user costs or productivity are significant, a qualitative assessment of the regulation's impact on production of major agricultural commodities and retail food prices of such commodities.

FIFRA section 10 cannot be provided. Specific inquiries concerning the Position Document, as well as requests for access to these files, should be directed to Project Manager Jeff Kempter, Office of Special Pesticide Reviews (WH-566), EPA, Rm. 447, East Tower, 401 M St. SW., Washington, D.C. 20460, 202-755-8053.

II. Presumptions

A. *Oncongenicity.* 40 CFR 162.11(a)(3)(ii)(A) provides that a rebuttable presumption shall arise if a pesticide "(i) nduces oncogenic effects in experimental mammalian species or in man as a result of oral, inhalation or dermal exposure . . . ." As a further clarification of the provision, the preamble to the Agency's Interim Procedures and Guidelines for Health Risk and Economic Impact Assessment of Suspected Carcinogens (May 25, 1976; 41 FR 21402) states that "a substance will be considered a presumptive cancer risk when it causes a statistically significant excess incidence of benign or malignant tumors in humans or animals."

On the basis of scientific studies and information summarized in the Position Document, the Agency has concluded that this risk index has been exceeded by all registrations and applications for registration of pesticide products containing PCNB, and that a rebuttable presumption against new or continued registration of such products has therefore arisen.

III. Grounds for Pesticide Review in Addition to Rebuttable Presumption Criteria

A. *General.* In addition to the risk criteria set forth in 40 CFR 162.11(a)(3) which require the issuance of a notice of rebuttable presumption against registration or continued registration and a determination by the Administrator to register or cancel a pesticide, 40 CFR 162.11(a)(6) provides that the Administrator may determine that a pesticide should be canceled or that a hearing should be held if the pesticide poses a substantial question of safety to man or the environment "based on toxicological data, epidemiological studies, use history, accident data, monitoring data, or such other evidence as is available to the Administrator."

A determination to cancel or deny registration of a pesticide or to hold a hearing based upon such data and a finding that a pesticide poses a substantial question of safety need not be preceded by public notice and opportunity for rebuttal prior to the administrative adjudicatory hearing procedure of section 6(b) of the Act. However, where the Agency is using a notice of rebuttable presumption against registration or continued registration based on the risk criteria of 40 CFR 162.11(a)(3), it is in the public interest to include all evidence which may indicate additional grounds for determining that a pesticide causes unreasonable adverse effects on the environment. Accordingly, evidence derived from studies which suggest that HCB may produce oncogenic and/or reproductive effects has been included in the positions document accompanying this notice.

IV. Registrations and Products Subject to the Notice

All registrants and applicants for registration listed below are being notified by certified mail of the rebuttable presumption existing against registration and continued registration of their products.

The registrants and applicants for registration shall have 45 days from the date this notice is sent or until December 5, 1977 to submit evidence in rebuttal of the presumption. However, the Administrator may, for good cause shown, grant an additional 60 days during which such evidence may be submitted. Notice of such an extension, if granted, will appear in the Federal Register.

V. Duty To Submit Information on Adverse Effects

Registrants are required by law to submit to EPA any additional information regarding any adverse effects on man or the environment which comes to a registrant's attention at any time, pursuant to section 6(a)(2) of FIFRA and 40 CFR 162.8(d). If any registrant of PCNB products has any published or unpublished information, studies, reports, analyses, or reanalyses regarding any adverse effects in animal species or humans, residues, and claimed or verified accidents to humans, domestic animals, or wildlife, which have not been previously submitted to EPA, the material must be submitted immediately. When responding to this notice, each registrant shall submit a written certification to the Agency that all information regarding any adverse effects known to the registrant has been submitted. In addition, the registrants should notify EPA of any studies currently in progress, including the purpose of the study, the protocol, the approximate completion date, and a summary of all results observed to date.

VI. Public Comments

During the time allowed for submission of rebuttal evidence, specific comments on the presumptions set forth in this notice and on the material contained in the Position Document are solicited from the public. In particular, any documented episodes of adverse effects to humans, domestic animals, or wildlife, and information as to any laboratory studies in progress or completed, are requested to be submitted to EPA as soon as possible. Specifically, information on the fate and effects of PCNB, its impurities (especially HCB), metabolites, and degradation products on flora and fauna, particularly ainmals with metabolism similar to man, is solicited. Similarly, any studies or comments on the benefits from the use of PCNB are requested to be submitted. All comments and information received, as well as any other relevant information and analysis thereof, which come to the attention of the Agency may serve as a basis for final determination pursuant to § 162.11(a)(5).

All comments and information should be sent to the office of the Federal Register Section at the address given above, if possible in triplicate to facilitate the work of the agency and others interested in inspecting them. The comments and information should bear the identifying notation "OPP-30000/17." Comments and information received within the specified time limit shall be considered before it is determined whether a notice shall be issued in accordance with 40 CFR 162.11(a)(5)(ii).

Comments received after the specified time period will be considered only to the extent feasible, consistent with the time limits imposed by 40 CFR 162.11(a)(5)(ii). All written comments and information filed pursuant to this notice will be available for public inspection in the office of the Federal Register Section from 8:30 a.m. to 4 p.m. during normal working days.

Interested persons are encouraged to take advantage of the opportunity to inspect Agency files during normal working hours since (1) all of the information received may serve as a basis for final determination pursuant to § 162.11(a)(5) and (2) the Agency will not generally publish a summary of information received in the Federal Register at the close of the rebuttal period.

Your cooperation is solicited in identifying any errors or omissions which may have been made in the following computer listings. Corrections to the listings may not necessarily be published in the Federal Register, but rather handled by mail with affected parties. Omissions will be corrected by notice in the Federal Register.

Dated: October 13, 1977.

Edwin L. Johnson,
Deputy Assistant Administrator for Pesticide Programs.

PCNB special local needs registrations approved by EPA under Sec. 24(c) of FIFRA

Registrant	Name and address	Permit No.	Product name
001258	Olin Corp., Agricultural Products Department, P.O. Box 991, Little Rock, Ark. 72203.	FL-770011	Terrachlor+ Dasanit 10-3 Granular.
001258	do	CA-760137	Terra-coat L-21.
004628	Mobil Chemical Co., P.O. Box 26683, Richmond, Va. 23261	FL-770009	MOCAP-PCNB 3-10 Granular.
004628	do	SC-770003	Do.
004628	do	NC-770004	Do.
004628	do	VA-770004	Do.

PENTACHLORONITROBENZENE (PCNB): POSITION DOCUMENT 1

EPA WORKING GROUP ON PCNB, JEFF KEMPTER, PROJECT MANAGER, OFFICE OF SPECIAL PESTICIDE REVIEWS, ENVIRONMENTAL PROTECTION AGENCY

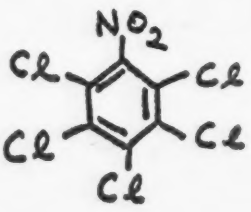
PENTACHLORONITROBENZENE (PCNB): POSITION DOCUMENT 1

I. BACKGROUND

A. *Characteristics of PCNB*

(1) *Nomenclature.* PCNB is the common name for pentachloronitrobenzene. Other common names are quintozene and terrachlor. Some trade names for PCNB are Avicol, Botrilex, Brassicol, Folosan, Terracior and Terrachlor. In many products PCNB is combined with other active pesticidal ingredients, such as captan, terrazole, phorate, maneb, thiram, zineb, disulfoton and others.

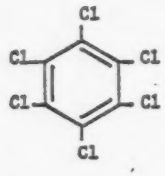
(2) *Chemistry.* Technical grade PCNB consists of about 98% PCNB and 2% related compounds, such as hexachlorobenzene, tetrachloronitrobenzene, and pentachlorobenzene. These and other metabolites are shown in figure 1. The molecular weight is 295.4. The molecular formula is C Cl NO. The structural formula for PCNB is:



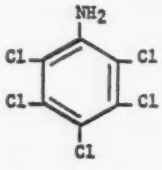
6 5 2

PCNB is a crystalline solid, pale yellow to white, depending on purity, with a musty odor. Its density is 1.718 at 25°C, its boiling point is 328°C at 760 mm Hg and its melting point is 142°–145°C. Some vapor pressures are:

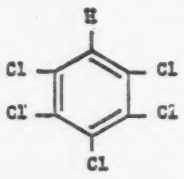
1.61×10^{-5} mm Hg at 10°C
5.0×10^{-5} mm Hg at 20°C
11.3×10^{-5} mm Hg at 25°C



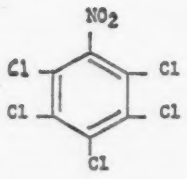
hexachlorobenzene (HCB)



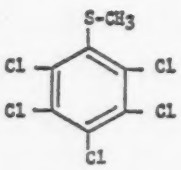
2,3,4,5,6-pentachloroaniline (PCA)



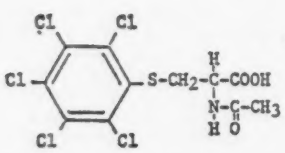
2,3,4,5,6-pentachlorobenzene (PCB)



2,3,4,5-tetrachloronitrobenzene (2,3,4,5-TCNB)



S-methyl pentachlorophenyl sulfide (MPCPS)



N-acetyl-S-pentachlorophenyl-L-cysteine

Figure 1. Chemical structures of PCNB impurities and various PCNB metabolites

PCNB is freely soluble in carbon disulfide, benzene, chloroform, ketones, and aromatic and chlorinated hydrocarbons, and is slightly soluble in alkanols. It is nearly insoluble in water (0.44 mg/1 at 20[C.) and in ethanol (2 mg/1 at 25[C).

(3) *Degradation, Transport and Soil Residues.*—Chacko et al. (1966) found that eight soil fungi species and nine actinomycete species, grown in nutrient media *in vitro*, degraded PCNB to pentachloroaniline (PCA). In one species of fungus, Nakanishi and Oku (1969) found that PCNB was metabolized to PCA and pentachlorothioanisole (PCTA). Several authors have stated that microbial degration of PCNB occurs only when the microorganisms are actively growing (Casely 1968, Ware and Roan 1970, Chako et al. 1966).

Casely (1968) traced the disappearance of PCNB from Yolo fine sandy loam through biological and non-biological pathways. He analyzed only for PCNB and not for its metabolites. Sterilized and unsterilized soil samples were measured for PCNB loss under moisture conditions of 3%, 20%, and 50% (equivalent to air dry, field capacity and saturated soil, respectively). It was found that only 10% of the PCNB escaped from the air-dry soil; 20% and 50% escaped from the moisture field-capacity and saturated soil samples, respectively. From these results the author observed that an increase in soil moisture increases the mobility of PCNB in the soil and thus increases losses through volatilization.

In the unsterilized field-capacity samples, 80% of PCNB was lost after 10 months. Three-fourths of this loss was to the water-saturated air passed over the sample and one-fourth to microbial degradation. Undegraded PCNB was the major component of the removed air stream. The author concluded that "considerable quantities" of PCNB could be lost to the air in intensively cropped areas where irrigation is used.

Ko and Farley (1969) attempted to confirm the conversion of PCNB to PCA in soil. Residues of PCNB were measured in moist soil, sterilized-moist soil, submerged soil and sterilized-submerged soil. Only in the submerged soil did PCNB disappear (56% after 3 weeks); more than half of this amount was transformed into PCA. The authors concluded that this conversion resulted from soil micro-organisms. They suggested that the remaining PCNB was lost through a non-biological process, since the same amount disappeared from the sterilized-submerged soil.

Wang and Broadbent (1972) measured the rate of loss of PCNB from three California soils—Colombia fine sandy loam, Sacramento clay and Staten peaty muck. PCNB was found to have a halflife of 4.7, 7.6 and 9.7 months, respectively, in these soils. Kaufman (1970) confirmed that the conversion of PCNB to PCA is enhanced by submergence of treated soil in water.

The EPA National Soils Monitoring Program reports that in 1972 there were no detections of PCNB in any of 1,487 soil samples from 37 states (Memo, 1976). Of the 1,487 soil samples collected in 1973, only 3, or 0.3%, had detectable levels of PCNB. Residues ranged from 0.22 to 2.61 ppm. Pesticide applications had been made at seven of these sites in 1973 (0.5% of 1402 responses) with an average total application of 0.2 lb/A (0.02 kg/ha).

(4) *Bioaccumulation and Metabolism.*—(a) *Plants.* Casanova and Dubroca (1973) studied the residues of PCNB found in lettuce after treatment of the soil with PCNB. In the first set of experiments, PCNB was applied to the soil before planting at rates of 15 and 30 kg AI/ha. Residues were determined by gas chromatography after 12 weeks of growth. Table 1 gives the results of the residue tests.

TABLE 1.—*Residues of PCNB in lettuce leaves (parts per million) from plants grown in treated soils*

Study location (in France)	Soil treatment rates, kilograms AI/ha		
	0	15	30
Nantes	0.51	0.63	1.10
Rennes	.17	.52	1.05
Nantes	.05	.47	1.15
Rennes	.07	.61	1.10
Rennes	.10	.16	.43
Average	.18	.48	.96

The residues after the application of 15 kg AI/ha were approximately 0.5 ppm, while the residues after an application of 30 kg approached 1.0 ppm, the established tolerance for PCNB in France. The authors suggest that this was due to PCNB applications prior to the study.

In the second set of experiments, the same application and test methods were used, except that analyses for HCB, an inherent contaminant of PCNB, were included and residues were determined not only in lettuce but also in soil before treatment and at the end of the growing season. The results are given in Table 2. The results of the first test were confirmed in the second test, which showed the presence of PCNB residues in lettuce at about 1.0 ppm after an application of 30 kg AI/ha. Residues of HCB from the same application were considerably lower than these values; they ranged from 0.02 in lettuce from untreated soils to 0.04 ppm in lettuce from treated soils.

TABLE 2.—*Residues of PCNB and HCB in lettuce from treated soil (parts per million)*

Location and procedure	Soil treatment rates, kilograms AI/ha					
	None		15		30	
	HCB	PCNB	HCB	PCNB	HCB	PCNB
Nantes:						
Lettuce	0.016	0.29	0.034	0.83	0.041	1.04
Soil (preplant)	.160	1.50	.160	1.50	.160	1.50
Soil (at harvest)	.170	1.57	.620	20.90	2.07	82.41
Rennes:						
Lettuce	.025	.34	.43	.66	----	----
Soil (preplant)	.080	.64	.090	.90	----	----
Soil (at harvest)	.087	.67	.660	10.27	----	----

Residues in soil before treatment varied considerably with the study location. HCB residues also varied, but they were consistently lower than the PCNB residues.

Casanova and Dubroca (1973) attempted to show that residues found in lettuce resulted from absorption from soil through roots rather than from surface contamination. In a laboratory, soil was treated with the equivalent of 15 and 45 kg AI/ha PCNB. Residue measurements were taken 8 weeks later. Table 3 shows the resulting residues.

TABLE 3.—*Residues of PCNB and HCB in soil and lettuce (parts per million)*

Nature of test	Soil treatment rates, kilograms AI/ha					
	None		15		45	
	HCB	PCNB	HCB	PCNB	HCB	PCNB
Treated soil	*N.D.	0.14	0.50	20.40	1.86	69.10
Lettuce	*N.D.	.03	.01	.73	.02	1.56

*N.D.=undetected.

Kuchar et al. (1969) studied the metabolism of PCNB in immature cotton plants. Cotton plants grown in soil containing 300 ppm of PCNB were monitored for PCNB, its impurities and its metabolites. Results after two weeks growth (roots included) were:

Component	Residues (parts per million)
PCNB	155.0
PCB	3.96
TCNB	.018
HCB	4.61
PCA	1.11
MPCPS	2.95

PCA had been found in young corn and soybean plants grown in PCNB-treated soil (Kuchar et al. 1969). Gorbach and Wagner (1967) have also cited PCA as a metabolite in potatoes, along with two unidentified metabolites. Kuchar et al. (1969) later described these unidentified substances as having gas chromatograph retention times identical to HCB and MPCPS.

HCB applied to wheat seed is translocated to the developing grain (Johns 1969, Smith 1969).

(b) *Animals. Rabbits.*—In a study conducted by Beets et al. (1955) 12 rabbits received either 1, 2, or 3 g of PCNB via stomach tube. Urine and feces were collected for 72 hours. An average of 62% of the administered dose was found in the feces from the 2 g dose and was considered unabsorbed. Another 11% of the dose could be accounted for as PCA in the urine. N-acetyl-S-(pentachlorophenyl)-L-cysteine was also isolated from the urine at a level 14% of the initial dose. Pentachlorophenol was formed only in trace amounts.

To determine the metabolic pathways of 2,3,4,5,-TCNB, 0.7 g was administered to rabbits as an aqueous suspension via stomach tube. The 2,3,4,5-TCNB was poorly absorbed; 33% was found in the feces after 48 hours. Further, 11% of the dose was excreted in the urine as 2,3,4,5-tetrachloroaniline (2,3,4,5-

TCA). The excretion of the glucuronide (41%) and the ethereal sulfate (6%) of 6-amino-2,3,4,5-tetrachlorophenol indicated that ring hydroxylation had occurred (Bray et al. 1953).

Dogs.—Purebred beagles, approximately 4.5 months old (4 per sex per dose), were fed 0, 5, 30, 180, or 1,080 ppm PCNB in their diets for two years (Borzelleca 1971). Olin technical grade PCNB (97.8%), containing 1.8% HCB, 0.4% 2,3,4,5-TCNB and 0.1% PCB, was used. Kidney, brain, skeletal muscle, liver, spleen, fat, bile, blood, urine, and feces samples were collected for analysis after two years. Electron-capture gas chromatography was used to detect the presence of PCNB, PCB, HCB, PCA, and MPCPS. Results for liver, kidney, fat, and feces at dose levels of 0, 5, 30, and 180 ppm dietary exposures are summarized in Table 4.

MPCPS appeared to have an equal propensity to be stored in the fat or skeletal muscle of the male rat. At the method's sensitivity level (unstated), a 60 day withdrawal period from the treated diet resulted in undetectable residues of PCA, MPCPS, and PCB in adipose tissue at all exposure levels. Substantial residues of HCB remained from all levels of dietary exposure.

TABLE 4.—*Dog tissues and excreta concentrations of PCNB, its metabolities (PCA, MPCPS), and related impurities (a) after 2 years on diet*

Tissue and diet	Concentrations found (parts per million)				
	PCNB	PCA	MPCPS	PCB	HCB
Liver:					
0	ND	<0.06	<0.05	<0.02	ND
5	ND	<.06	<.05	<.02	0.039
30	ND	<.06	<.10	<.02	.125
180	ND	<.06	<.05	0.54±0.61	.74
Fat:					
0	ND	<.08	<.03	.005	.005
5	ND	<.08	<.03	.093	.452
30	ND	<.08	<.03	.163	1.11
180	ND	<.08	(b) ND	.767	6.12
Kidney:					
0	ND	ND	ND	<.03	ND
5	ND	ND	ND	<.03	<.04
30	ND	ND	ND	<.03	<.10
180	ND	(c) .018	.021	<.10	<.60
Feces:					
0	0.004	(c) .005	(d) .014	ND	(c) .004
5	.059	.188	.134	.007	.009
30	.343	.450	.675	.03	.022
180	1.56	1.96	.192	.03	.072

(a) PCNB, 97.8 pct; HCB, 1.8 pct; PCB, 0.1 pct; 2, 3, 4, 5-TCNB, 0.4 pct.
(b) 2 of 3 samples.
(c) 1 dog, ND in 2.
(d) Average 2 dogs, ND in 1.

Rats.—Finnegan et al. (1958) conducted an initial study to determine the amount of PCNB stored in the fat of male and female albino rats. The diets contained 0, 63.5, 1,250, or 2,500 ppm of PCNB as a 25% dust. The animals were fed for 3 months and then sacrificed. The results showed a dose-related increase in content of PCNB in adipose tissue. Subcutaneous and perirenal fat samples were taken to be analyzed by neutron activation of chlorine. For the respective dietary levels, the average chlorine concentration in ether extracts of fat was 42.4, 392, 571, and 1,151 ug/g in males, and 43.7, 470, 875, and 1,316 ug/g in females.

As stated by Kuchar et al. (1969), the neutron activation process was later found to be inadequate for determining residues of PCNB or its metabolites in animals.

A subsequent study by Borzelleca et al. (1971) stated that the residue in the fat originally identified as PCNB consisted mostly of the impurities PCB and HCB.

As part of a reproduction study (Borzelleca et al. 1971), a portion of F-2b generation rats were fed diets containing 0, 5, 50, or 500 ppm PCNB for approximately 3 weeks following weaning. The animals were sacrificed after producing two litters. Analyses were made of composites of tissue and excreta from three rats of the same sex and dietary level. Those animals that were not sacrificed at this time were returned to control diets for two months. Residues of PCNB, HCB, PCB, PCA, and MPCPS were found in skeletal muscle, liver, kidney, fat, and feces at the end of the 33 week feeding period and two months after withdrawal from treated diets (see Table 5).

The major tissue of storage appeared to be adipose tissue (fat) where both PCB and HCB displayed dose-related storage levels. This storage trend continued to the 1,080 ppm exposure level, where respective storage levels of PCB and HCB increased to 5.15 and 194 ppm, respectively. No significant amounts of any product, including PCNB, were found in the urine. Decreased elimination of HCB from animal tissues over an extended time period was indicated by dose-related levels of HCB in fecal matter at the end of the 60 day withdrawal period.

TABLE 5.—*Rat tissue and excreta concentrations of PCNB, its metabolites (PCA, MPCPS), and related impurities (PCB, HCB)*

Specimen and diet (parts per million)	Days on control, diet (a)	Sex	Concentrations found (parts per million)				
			PCNB	PCA	MPCPS	PCB	HCB
Sk. muscle: 500	0	M	(b) ND	0.117	8.13	0.042	29.7
Liver: 500	0	M	ND	.069	.306	.010	1.93
Kidney: 500	0	M	ND	.084	.269	.131	6.43
Fat:							
5	0	M	ND	ND	.060	<.001	.587
5	0	F	ND	ND	.055	<.001	.824
50	0	M	ND	.019	.46	.019	10.8
50	0	F	ND	.095	.345	.011	4.73
500	0	M	ND	1.11	4.74	.304	117
500	0	F	ND	.238	3.82	.176	49
5	60	M	ND	ND	ND	ND	1.07
50	60	M	ND	ND	ND	ND	3.67
500	60	M	ND	ND	ND	ND	22.3
Feces:							
5	60	M	ND	ND	ND	ND	.023
50	60	M	ND	ND	ND	ND	.137
500	60	M	ND	.027	.101	ND	1.95

(a) After 33 weeks on test diets.
(b) ND=None detected.

Cows.—PCNB (Olin technical grade) was dissolved in corn oil and administered orally in gelatin capsules to cows (Borzelleca et al. 1971). Doses for each cow were dependent upon the animal's consumption of feed the previous week. Three cows per dose level received 0, 0.1, 1.0, or 10 ppm PCNB for 12 to 16 weeks. Fat biopsies for analyses during the course of the study were collected from the brisket area; additional tissues were obtained at autopsy. The cows were milked twice daily. An aliquot was removed and analyzed by a gas chromatograph equipped with electron capture. Levels of detectability for control and treated samples differed from week to week; consequently, the results are difficult to assess accurately. Tissue samples included skeletal muscle, liver, kidney, and abdominal and subcutaneous fat.

Considerable variation in residue levels was noted when individual samples were analyzed. Levels of HCB in milk from cows fed a diet of 1 ppm PCNB ranged from 0.001 to 0.003 ppm between the twenty-first and fifty-sixth days of continuous exposure. The average value was 0.002 ppm. At a dietary level of 10 ppm PCNB, the HCB residue ranged from non-detectable to 0.015 ppm, with an average value of 0.01 ppm. Levels of PCNB, PCA, MPCPS, and PCB showed sporadic variation, but were generally 0.005 ppm or less. There was little indication of dose-related level changes.

Samples of subcutaneous fat biopsied at 0, 1, 2, 4, 7, and 8 weeks after exposure to 10 ppm in the diet suggested a 0.5 ppm plateau of HCB residue beginning in the fourth week and continuing through the eighth week. PCA appeared to stabilize at a level of about 0.1 ppm between weeks 1 and 8 at the 10 ppm dietary exposure level. The remaining residues (PCA, PCNB, and MPCPS) were negligible or non-detectable.

Guorsaud et al. (1972) studied the relationship of HCB residues in endive roots to residue levels of HCB in the milk of cows eating the roots. First they determined that of all the pesticides used only PCNB was chemically related to HCB. Using gas chromatography, they found that the roots of the endives were contaminated with both HCB and PCNB and that the milk of cows eating these endives was contaminated with HCB. The most contaminated milk (26 ppm HCB) was from cows receiving 25 to 30 kg of endive roots per day. The roots were contaminated with 0.11 ppm of HCB. Another sample of milk containing 0.13 ppm of HCB came from a cow receiving endive roots contaminated with 0.006 ppm HCB.

In a subsequent study (Goursaud et al. 1972), a cows received a feed mixture containing 12 kg of endive roots contaminated with 0.16 ppm HCB and 2.16 ppm PCNB. The residues found in the milk are shown in Table 6. The authors concluded that the HCB contamination in the milk was linked to the application of PCNB to endives. They speculated that the source of HCB was from original formulation rather than from PCNB degradation.

TABLE 6.—*Residues of HCB and PCNB (parts per million) in milk of cows fed treated endive roots*

	HCB	PCNB
Milk sampling day:		
0*	0.21	Negligible for all samples.
1	.57	
2	1.23	
3	1.34	
4	1.68	
5	1.83	
6	2.00	
7	2.02	

*Day 0 means the day before the root-feed mixture was fed to the cows.

Feeding studies have shown that HCB is assimilated in the fat and other tissues of sheep (Craig and Dwyer 1961, Avrahami and Steel 1972a), chickens (Craig 1959, Watts 1968a, 1968b, Avrahami and Steel 1972b, 1972c), pigs (Gardiner and Armstrong 1960, Hansen et al. 1977), Japanese quail (Vos et al. 1968, 1971), kestrels (Vos et al. 1972), lambs (EPA 1976), rats (Medline et al. 1972, Villenueve 1975, Kuiper-Goodman et al. 1977), and aquatic organisms (Laseter et al. 1976, Isensee 1976).

Field studies have reported the occurrence of HCB residues in fish (Zitko 1971, Koeman et al. 1969, Holden 1973, Johnson et al. 1974), poultry products (Stanhope 1969, Tuinstra and Roos 1970, Goursaud et al. 1972, Smyth 1972), birds (Gilbertson and Reynolds 1972, Zitko and Choi 1972, Cromartie et al. 1975, Nickerson and Barbehenn 1972, White 1976, White and Heath 1976), edible animal tissues (Booth and McDowell 1975), and human milk and tissues (Bick 1967, Acker and Schulte 1970, Abbott et al. 1972, Siyali 1972, Brady and Siyali 1972, Curley et al. 1973, Neuhaus et al. 1973, Graca et al. 1974, Stacey and Thomas 1975, EPA 1977).

(5) *Tolerances and Food Residues.* Before any pesticide or any inert ingredient of a pesticide formulation may be used on a food or feed crop, a tolerance or exemption from a tolerance must be established. A tolerance is defined as the maximum residue level allowed for a particular pesticide on a raw agricultural commodity or a processed food or feed. It is based on the maximum residue expected from the proposed use and on the toxicological data submitted by the registrant. PCNB tolerances are summarized in Table 7.

TABLE 7.—*U.S. tolerances* for PCNB on raw agricultural commodities (40 CFR 180.291)*

Crop	Parts per million	Crop	Parts per million
Bananas	0.1	Cottonseed	0.1
Beans	.1	Garlic	.1
Broccoli	.1	Peanuts	1.0
Brussels sprouts	.1	Peppers	.1
Cabbage	.1	Potatoes	.1
Cauliflower	.1	Tomatoes	.1

*All tolerances are interim except for cottonseed.

FDA Market Basket surveys from 1964 to 1969 detected very small residues of PCNB in only 0.7% of leaf and stem type vegetables sampled. Residues ranged from 0.005 ppm to 0.42 ppm, with an average of 0.01 ppm (Duggan et al. 1971). In the Market Basket Survey between June 1971 and June 1972, trace residues were found in only one sample (oil, fat, or shortening). HCB residues ranged from 0.002 to 0.011 ppm in 4 composite samples, while PCA residues were found from 0.005 to 0.023 ppm in 3 composite samples (Manske and Johnson 1975).

In another FDA survey for 1973–1974, individual items in the dairy and meat composites in four market baskets were analyzed. PCNB residues occurred from 0.002 to 0.005 ppm in 7 composites. HCB ranged from 0.0003 to 0.0070 ppm in 17 composites. PCA was found from 0.004 to 0.050 ppm in 10 composites. TCNB occurred at 0.001 to 0.284 ppm in 8 composites (Manske and Johnson 1977).

Samples from FDA compliance and surveillance programs during 1972–1976 showed small residues in animal feed, vegetables and cottonseed meal (U.S.F.D.A. 1976).

HCB has been shown to survive the milling process of wheat and remain in the final product (Old 1969). It has also been detected at 0.010 ppb in raw and 0.006 ppb in finished U.S. drinking water (Murphy 1975).

(6) *Toxicity.* (a) *Acute. Rats.*—The oral LD-50 for technical grade PCNB (Olin product) as a 10% solution in corn oil was found to be 1.71 ± 0.17 g/kg for females (Finnegan et al. 1958). The oral LD-50 of a 75% wettable powder commercial formulation (Olin product) administered as a 40% aqueous suspension to male rats was greater than 12 g/kg.

Dogs.—Groups of 10 mongrel dogs were administered PCNB (Olin product) via gavage as a 10% solution in warm corn oil. Doses up to 2.5 g/kg did not produce any deaths, although half of the dogs on this dosage level vomited (Finnegan et al. 1958).

Rabbits.—Percutaneous toxicity was tested in male albino New Zealand rabbits weighing an average of 1.96 kg (Borzelleca et al. 1971). Animals with intact and abraded skin were used. The hair was removed from the trunk with an electric clipper and abrasions were made with a metal grid. The rabbits were restrained in stocks for 24 hours. PCNB (Olin product) was dissolved in dimethyl phthalate as a 30% solution and applied over the trunk under the restraining device. Doses of 10.0 ml/kg and 13.3 ml/kg were applied to 10 rabbits with intact skin and 13.3 ml/kg was administered to 10 rabbits with abraded skin. During the 14 days following dosing these were no indications of toxicity or skin irritation.

(b) *Subacute. Rats.*—Five groups of 7 male and 7 female albino rats of weanling age were divided into separate groups for a 3 month study. Each was fed a diet containing 1 of 5

levels of PCNB (Olin Product) at 0, 63.5, 635.0, 1,250, 2,500, or 5,000 ppm. The animals were weighed at weekly intervals and a hematologic study was done upon termination of the study. Body weights for males were significantly depressed at the 2,500 ppm level. The males and females on the 5,000 ppm level were killed at the end of 2 weeks. At the 1,250 and 2,500 ppm levels, the kidney-to-body weight ratios showed a significant increase for male rats. Significant increases in the liver-to-body weight ratios were found at all levels except in the females fed 63.5 ppm (Finnegan et al. 1958).

Rtas (10 per sex per dose) were fed technical PCNB (purity and source unknown) in their diets at rates of 0, 1,000, 5,000, or 10,000 ppm for 90 days. The growth rate of rats fed 5,000 ppm PCNB was slightly less than that of controls. Rats on the 10,000 ppm diet had an even lower growth rate (FAO/WHO 1970).

Dogs.—Groups of 3 mongrel dogs were placed on diets containing either 25, 200 or 1,000 ppm PCNB for 1 year. The PCNB (Olin product) was added as a dust formulation consisting of 20% PCNB, 77% Pyrax ABB and 3% Armour "Sticker." The dogs were weighed at weekly intervals and hematologic studies were made at the start, mid-point and termination of the study. The PCNB did not inhibit growth or result in any significant hematological or histopathological changes (Finnegan et al. 1958).

(c) *Chronic. Rats.*—Finnegan et al. (1958) conducted a 2 year study in which rats in groups of 10 males and 10 females were fed a diet containing 0, 25, 100, 300, 1,000 or 2,500 ppm PCNB. The PCNB (Olin product) was the same formulation as for the dog experiment discussed above. Rats were housed individually and weighed weekly. They were given hematologic examination during the eleventh and twenty-fourth months of the experiment. Deaths did not correlate with the dose of PCNB. Female rats showed a slight growth suppression at 100 ppm and above. The growth of male rats accelerated, especially at 25 ppm. Hematological values were within normal ranges. Lung abscesses and fatty changes in the liver did not correlate with PCNB dose.

Dogs.—In a study conducted by Farbwerke Hoechst AG (cited in FAO/WHO 1970), groups of 6 dogs, 3 males and 3 females, were fed diets containing 0, 500, 1,000 or 5,000 ppm PCNB (purity not specified) for 2 years. Liver changes occurred in all groups and the degree was dose related. The 5,000 ppm level produced fibrosis, narrowing of hepatic cells, thick leucocyte infiltration and increased size of the periportal areas. At the 500 and 1,000 ppm levels, the changes were similar but to a lesser degree. The highest dose level also produced atrophy of bone marrow and reduced hematopoiesis.

In another study (Borzelleca et al. 1971), purebred beagles, approximately 4.5 months old, were fed a diet containing PCNB (Olin product) at 0, 5, 30, 180, or 1,080 PRM for 2 years. Hematocrit values showed a significant decrease at 18 months for males receiving dosages of 30 and 180 ppm. There was no change for males at 1,080 ppm. There were no dose related effects on urine analysis, blood chemistry, mortality, body weight, food consumption or the estrus cycle. A ratio of organ-to-body weight data showed a significantly greater value for livers of the dogs at 1,080 ppm PCNB. No treatment-related lesions were observed in dogs sacrificed at 1 year. In dogs sacrificed after two years, cholestatic hepatosis with secondary bile nephrosis was found in those dosed at 180 ppm and 1,080 ppm. Although these correlated with dosing, the authors considered the lesions reversible.

B. *Registered Uses and Supplies*

(1) *Products.* PCNB, a versatile fungicide, is an active ingredient in 233 Federally-registered products and 98 State-registered products. It is not used as inert ingredient in any registered products. PCNB is formulated as wettable powders, dusts, emulsifiable concentrates, granules, and in combination with other active ingredients previously listed.

(2) *Use Patterns.* 295,000 pounds of PCNB were used as a soil fumigant in 1971; 7,000 pounds were used for seed treatment (EPA 1976). Of the soil fungicide applied, 77% was used on cotton, 19% on peanuts, and 4% on nursery and fruit crops, and vegetables. It is unlikely that PCNB is used on more than 12% of the total U.S. cotton acreage and 2%–3% of the U.S. peanut acreage (EPA, 1976).

C. *Supply*

The sole manufacturer of PCNB is the Olin Chemical Corp. of Stamford, Conn. In 1971 annual production was 3 million pounds active ingredient (National Academy of Sciences 1975). According to the Olin Corporation, about a quarter of its production is exported. The U.S. Department of Agriculture has not recorded any imports.

II. REGULATORY HISTORY

A. *Past Actions*

On January 14, 1959, a registration for Technical Grade PCNB (EPA Reg. No. 1258–517) was issued to Olin Mathieson Chemical Corporation. This later became the Olin Chemical Corporation, the current holder of the PCNB technical registration. After the technical material was registered, numerous end use products were registered for various uses, including food crop uses. Tolerances for PCNB were set at zero.

In June 1965, the National Academy of Sciences National Research Council issued a report recommending that "no residue" and "zero tolerance" concepts be abandoned. The report stated that zero tolerances were not desirable, since, as experience bore out, residues might be present at levels below the current sensitivity of detection methods.

On April 13, 1966 a joint USDA-HEW statement for implementation of the recommendation was published in the FEDERAL REGISTER. The plan included discontinuation by December 31, 1967 of registrations involving residues on food or feed for which a tolerance or exemption were lacking. However, extensions were granted until December 31, 1970, if progress was being made toward showing that the registration could be continued without undue hazard to the public health.

In late 1967, PR Notice 67-10 informed registrants of the extension of certain no residue and zero tolerance registrations beyond December 31, 1967. A FEDERAL REGISTER notice of April 15, 1967 stated that registrations involving food or feed on a no residue or zero tolerance basis would be cancelled unless (1) FDA established finite tolerance or (2) a progress report were submitted to show studies were underway to support such tolerance. All registered uses of PCNB listed in the USDA Summary of Agricultural Pesticides (Compendium) were extended until January 1, 1969.

On September 4, 1968, a petition to establish tolerances on several crops was received by the Federal Food and Drug Administration (FDA). This petition was filed (i.e. accepted) on September 11, but on October 20 was found to be inadequate. PCNB was certified for usefulness on alfalfa, celery, clover, beans, bananas, broccoli, brussel sprouts, cabbage, cauliflower, cottonseed, flaxseed, garlic, lettuce, mushrooms, peanuts, peppers, potatoes, and tomatoes on December 27, 1968.

PR Notice 69-2, issued on January 10, 1969, again extended affected registrations, beyond December 31, 1968 to January 1, 1970, based on the petition to FDA for uses in the USDA Summary. These include alfalfa, bananas, beans (all), beans (pole), beans (bush), broccoli, brussel sprouts, cabbage, cauliflower, clover, cotton, cotton (seed), garlic, lettuce (head), peanuts, peppers, potatoes, and tomatoes, (staked, unstaked, and green house).

On February 19, 1969, these petition data were found sufficient to support issuance of requested negligible residue tolerances (0.1 ppm) and 1 ppm on celery. On March 21 that year PCNB residue data and analytical methods were evaluated, and on August 1, the petition was amended by Olin Corporation. This amendment was evaluated on February 19, 1970.

PR Notice 70-1, issued on January 19, 1970 yet again extended registrations, this time beyond December 31, 1969. Some PCNB uses were extended to January 1, 1971; these uses are listed in the EPA Compendium of Registered Pesticides, which superceded the USDA Summary. PR 70-8, issued on March 10, 1970, informed registrants of further needs for toxicological information; specifically, carcinogenicity and teratogenicity studies were requested to be submitted or to be initiated for PCNB.

In March 1970, FDA recommended establishment of the proposed tolerances in spite of findings by the U.S. Department of Health, Education and Welfare of possible tumorigenic and teratogenic effects (DHEW 1969). A dissenting opinion from FDA, on the other hand, recommended further data requests because of these findings. Finally, on May 1, 1970, the amended petition was withdrawn because of an EPA requirement that the petitioner resolve the issues raised by DHEW. Later, on May 25, a petition for cottenseed was resubmitted, and on February 17, 1971, a permanent tolerance was issued at 0.1 ppm.

In the meantime, on December 14, 1970 a new petition, was received by EPA. It proposed tolerances on peanuts at 1.0 ppm and bananas, beans, broccoli, brussel sprouts, cabbage, cauliflower, garlic, peppers, potatoes, and tomatoes at 0.1 ppm. Additional data were not submitted and thus EPA refused to file the new petition. In addition, since evidence did not support or was not submitted in support of PCNB uses on alfalfa, clover, and lettuce (head), these uses were cancelled while remaining uses were extended until further notice.

Olin requested on October 11, 1971, a reconsideration of the petition, since the World Health Organization (WHO) had established a temporary acceptable daily intake which was based on crop residue data in agreement with the proposed tolerances. As a consequence, on November 10, EPA filed the amended petition and on November 23 issued a Certification of Usefulness for 0.1 ppm on bananas, beans, broccoli, peppers, potatoes, and tomatoes and 1 ppm in or on peanuts. However, on February 23, 1972, EPA recommended against establishment of proposed tolerances and requested further requirements to be met by the petitioner.

On May 9, the petition was evaluated. When eight deficiencies were found, EPA requested further data. In a letter to Olin Corporation dated May 25, EPA outlined these deficiencies and stated that the toxicology review could not progress without the results of the carcinogenic and teratogenic tests in progress. On December 2, 1972, interim tolerances were established identical to the proposed tolerances. Olin proposed amendments

to the petition on January 30, 1973, which were accepted on March 2, 1973.

On March 14, 1973, EPA stated that a teratology study submitted by the registrant had satisfied one of the toxicological requirements for making the proposed tolerances permanent. However, it was noted that the carcinogenicity study still had to be submitted before permanent tolerances could be recommended.

EPA informed the registrant on June 5, 1973 that only two of the deficiencies had been corrected, while six were still unresolved. It was recommended that permanent tolerances not be established. It was stated that a tolerance of 0.2 ppm for total residues of HCB, PCB and PCA would be required for meat, fat and meat by-products of cattle, goats, horses and sheep, and 0.2 ppm in milk fat. It was stressed that these suggested tolerances for HCB were based only on HCB arising from PCNB uses; the tolerance pending for HCB under another petition might require addition of a paragraph under 40 CFR 180.3 specifying that residues of HCB shall not exceed the higher of the two tolerances.

EPA received a progress report on the National Cancer Institute cancer bioassay on rats and mice on February 21, 1974.

On July 9, 1974, the petitioner was notified of the acceptability of protocols for chicken feeding study, and this study was received by EPA on November 17, 1975.

In summary, while there exists a permanent tolerance for cottonseed, tolerances for residues of PCNB on other crops listed in Table 7 are interim. Finalization of these into permanent tolerances is pending the outcome of this RPAR investigation and further review by the EPA Registration Division.

B. *Referral to OSPR*

Action was started by OSPR on the basis of the findings in Section III below, that PCNB induced a statistically significant increase in the incidence of tumors in mice. PCNB was accepted as a candidate for RPAR review in July 1976, by the Director, Office of Special Pesticide Reviews.

III. SUMMARY OF SCIENTIFIC EVIDENCE TO SUPPORT REBUTTABLE PRESUMPTION—ONCOGENICITY

40 CFR 162.11(a)(3)(ii)(A) provides that a "rebuttable presumption shall arise if a pesticide's ingredient(s) * * * [i]nduces oncogenic effects in experimental mammalian species or in man as a result of oral, inhalation, or dermal exposure * * *." Section 162.3(bb) defines the term oncogenic as "the property of a substance or a mixture of substances to produce or induce benign or malignant tumor formation in living animals."

Several studies have been examined by the Agency which present evidence that PCNB meets the above criterion. Briefly, these findings are that PCNB induced:

1. A significant increase in hepatic carcinomas in male mice exposed to 1,000 to 3,000 ppm PCNB in the diet ($p<0.021$).

2. A significant increase in fibrosarcomas of the skin in female mice at 1,200 ppm in the diet ($p<0.001$).

3. A significant increase in hepatomas in male mice fed 1,206 ppm in the diet ($p<0.011$).

4. A significant increase in skin papillomas in mice receiving PCNB as an initiating agent followed by croton oil applications (males, $p<0.0225$; males and females and females combined, $<p0.011$).

5. A higher occurrence of malignant lymphoreticular tumors in male rats exposed to 1,200 ppm in the diet ($p<0.0548$).

Following are descriptions of the tests which resulted in these conclusions.

A. *Hazleton Carcinogenesis Bioassay of PCNB*

A carcinogenesis bioassay of PCNB was started in 1972 at Hazleton Laboratories, Inc., on behalf of the National Cancer Institute. The experiments used Osborne-Mendel rats (Supplier: BmI) and B6C3F1 mice (Supplier: Charles River Laboratories).

These animals were fed a mixture of corn oil and PCNB *ad libitum* at two dose levels, with 50 males and 50 females of each species in each group. Control groups for each species consisted of 20 animals of each sex.

The composition of the PCNB has been reported by the supplier as (Olin Corporation letter, 1976):

	Weight (percentage)
Pentachloronitrobenzene	98.1–98.2
Pentachlorobenzene	.11–0.16
Chloranil	.13–0.15
2,3,4,5-Tetrachloronitrobenzene	.22–0.29
Hexachlorobenzene	1.0
High Boiler (unknown)	.30–0.22

Male rats in the low dose group received 7,500 to 5,000 ppm, and 15,000 to 10,000 ppm PCNB in the high dose group. These doses were decreased to the second dosage rate after 14 weeks and continued until feeding was completed at 78 weeks. Low dose females were fed 11,000 ppm for 14 weeks; this was decreased to 7,250 ppm PCNB for the remainder of the experiment. High dose females received 22,000 ppm for 14 weeks and 14,500 ppm for the remaining feeding period. All animals were sacrificed after 111–113 weeks.

Mice were fed PCNB for 78 weeks. Low dose males were fed increasing doses of 1,075 ppm to 3,000 ppm, and high dose males received 2,150 to 6,000 ppm. Low dose females were fed 2,320 to 4,500 ppm and the high dose groups received 4,640 to 9,000 ppm. Surviving animals were sacrificed 91 to 93 weeks after the start of feeding.

The results obtained from rats showed a higher incidence of carcinomas in low dose PCNB-treated males and females. Female rats fed the low dose also had increases in malignant tumors. However, these observations are not statistically significant ($p<0.05$).

Carcinomas of the liver increased in low dose male mice, with eight of eighteen mice (44%) in that group, compared to two of twenty control male mice, developing carcinomas. This is significant at $p<0.021$ (Albert, 1977).

B. *Central Institute for Nutrition and Food Research—Mouse Study*

At the request of Farbwerke Hoechst AG (Frankfurt, W. Germany), the Central Institute for Nutrition and Food Research conducted a mouse carcinogenesis bioassay of PCNB (Van der Heijden and Til 1974). According to the report, the technical grade sample contained:

	Weight percentage
Pentachloronitrobenzene	98.2–98.3
Hexachlorobenzene	2.7
2,3,4,5-tetrachloronitrobenzene	1.1
2,3,5,6 - tetrachlornitrobenzene and 2,3,4,6-tetrachlornitrobenzene	0.64
Chloranil	<0.5

Diet pellets were administered *ad libitum* to SPF (Swiss random bred) males and females in 0, 100, 400 and 1,200 ppm dose groups for 80 weeks.

Gross necropsies were conducted. Tissues and tissues with gross abnormalities, three sections of the liver and each lung lobe were histologically prepared and examined. The gross examination showed skin abscesses and subcutaneous masses in females that had ingested 1,200 ppm PCNB. From tissue specimens, they were identified as fibromas and fibrosarcomas. 12 of 91 females at this dose level, compared to none of the 90 control females, had these tumors at $p<0.001$ (Albert 1977).

C. *Central Institute for Nutrition and Food Research—Rat Study*

In September 1971 the Institute began a carcinogenesis test for PCNB on rats at the behest of Farbwerke Hoechst A.G. (Anonymous undated). The technical material was the same as that used in the mouse study. Males and females, 50 per dose group, were fed a diet of 0, 100, 400 and 1,200 ppm for 104 weeks.

Complete gross necropsies were conducted to provide tissues for histological fixing and scrutiny. Tissue examinations were detailed for 20 males and females from the control and 1,200 ppm groups, but were limited to the liver for all other animals and to grossly visible tumors or lesions suspected of being tumors.

26 of 47 (55%) males ingesting 100 ppm had significantly more lymphoreticular tumors of the lung ($P<0.0548$). Most of these tumors were reticulum cell sarcomas; 20 of 47 tumors were found in treated males and 8 of 44 tumors were seen in untreated males (Albert 1977).

D. *Innes Mouse Study*

A tumorigenicity screening study on PCNB was conducted by Bionetics Research Laboratories, Inc. from 1966–1967 for the National Cancer Institute (Innes et al., 1969). While the purity of the sample was not reported, it is suspected that it contained about 88% PCNB and 11% hexachlorobenzene (U.S.E.P.A. 1976b).

Strain X and Strain Y mice, (C57BL–6 x C3H/Anf)F1 and (C57B1/6 x AKR)F1, respectively, were administered 464 mg/kg PCNB (maximum tolerated dose) by stomach tube at seven to 28 days of age and orally in the diet *ad libitum* at 1,206 ppm up to necropsy at 78 weeks. There were 18 males and 18 females of each species in the control and treated groups.

Mice were grossly examined post mortem externally and in the thoracic and abdominal cavities. Tissues of major organs and of grossly visible lesions were reviewed microscopically. The cranium and thyroid glands were not dissected.

A significantly elevated incidence of liver tumors was found in the Strain Y males ingesting PCNB. 10 of 17 (59%) treated males compared to 1 of 17 (6%) of control males had hepatomas at $p<0.00246$ (Albert 1977).

E. *Tumor Initiating Study in Mice*

The University of Birmingham Cancer Research Laboratories in Birmingham, England, has conducted a study on the tumor initiatory activity of technical PCNB (Searle, 1966). The purity of the compound was not reported.

Treated and untreated groups of albino mice (background unspecified), 6–8 weeks old, were assigned 10 males and 10 females each. The backs of mice to be treated were shaven and 0.3% PCNB dissolved in 0.2 ml acetone was applied twice weekly for 12 weeks. These mice then received applications of 0.25% croton oil on the same skin area for another 20 weeks. Mice were killed 20 weeks after the last croton oil treatment.

Total number of tumors and the numbers of mice bearing visible skin tumors were recorded weekly during croton oil treatment, and biweekly thereafter. Papillomas less than 1 mm in diameter or persisting less than three weeks were not counted.

Mice from treated and untreated groups began to develop papillomas after 5–8 weeks of croton oil treatment. Papillomas increased in number until 5–10 weeks after cessation

of applications, when some papillomas regressed. Seven treated males had tumors as compared to only one in the control group, significant at $p<0.0225$ (Albert 1977).

Also, 14 of 20 treated males and females (combined), compared to 5 to 20 untreated males and females (combined) had papillomas, which is significant at $p<0.0225$.

IV. OTHER ADVERSE EFFECTS ON WHICH THE AGENCY SEEKS ADDITIONAL INFORMATION

The Agency is concerned about preliminary information which indicates that HCB, an inherent contaminant of PCNB may induce oncogenic and other chronic effects in test animals. Since the reports providing most of the information are not yet in final form, the Agency cannot determine at this time that any RPAR criteria have been met by PCNB on the basis of these HCB reports. However, when final and verified reports are obtained, they will be fully evaluated along with other published studies which alone are not grounds for an RPAR (Courtney 1976, Khera and Villenueve 1975, Villenueve and Khera 1975). If an RPAR is declared for the potential effects of HCB in PCNB, a supplemental RPAR notice may be issued in the FEDERAL REGISTER for PCNB. If the Agency declares an RPAR for all products other than PCNB which contain HCB, a separate FEDERAL REGISTER notice will be issued, and all PCNB registrants may respond accordingly. A summary of the information awaiting consideration follows:

A. *Oncogenicity*

Dr. J. R. Cabral, while previously with the Eppley Institute for Research on Cancer, University of Nebraska, preliminarily reported that HCB induces oncogenic effects in hamsters (Cabral 1977a and 1977b).

Male and female Syrian golden hamsters were fed HCB in the diet at doses of 0, 50, 100, and 200 ppm, with 40, 30, 30, and 60 animals of each sex in each dosage group, respectively. After 80 weeks of feeding, significant increases in hepatomas were observed in HCB treated animals (low dose females, 37.5 percent, and males 27.2 percent; middle dose females, 42 percent, and males, 75 percent; high dose females, 81 percent, and males, 87 percent) compared to no hepatomas in untreated hamsters. Hemangioendotheliomas occurred significantly higher in hamsters receiving 200 ppm HCB (females, 9 percent, and males, 34 percent) than controls. Thyroid tumors were present only in treated animals and in proportion to the dose.

B. *Reproductive and Other Adverse Effects*

Linder et. al. (1977) are nearing the completion of a multi-generation reproductive study and some auxiliary experiments in rats. While the final results of the test are not yet available, the preliminary findings and the test design are of interest.

Technical grade hexachlorobenzene (HCB) was fed to rats at dietary concentrations of 0, 5, 20, or 100 ppm, and manifestations of toxicity observed through weaning of the third filial generation. Suckling pups of rats fed 100 ppm developed tremor and most of them died 4–14 days after birth. At weaning, liver weights of pups were increased in each filial generation of the group fed 20 ppm HCB, and, to a lesser degree, in some weanlings of the group fed 5 ppm. Significant HCB residues were found in whole fetuses and stomach contents of sucklings whose parents were fed 100 ppm HCB. Pathologic changes in the liver, consisting of hepatocellular enlargement in both sexes and slightly increased hemosiderin in females, were limited to adult rats fed 100 ppm HCB. In the lungs, an increase in size, number and distribution of intraalvelor (lipid-containing) macrophages was observed in HCB-treated rats. Porphyrinuria and excess storage of hepatic porphyrins occurred primarily in female rats fed 100 or 20 ppm HCB.

The Agency requests that any party having new or additional information on these or other potential adverse effects of PCNB or HCB submit such information for consideration in the RPAR process.

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*Not cited in text, but included in Working Group review.

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

REGISTRANT *NAME AND ADDRESS*

* 000148 THOMPSON-HAYWARD CHEMICAL COMPANY
BOX 2383
KANSAS CITY KS 66110

********** PRODUCT NAME **********

**00764* DE-PESTER TERRACHLOR 10% GRANULES

**00780* DE-PESTER TERRACHLOR-CAPTAN HO 10-10

**01040* T-H 20% TERRACLOR DUST

**01062* T-H TERRACLOR 2 LB. EMULSIFIABLE CONCENTRATE

**01077* T-H 10% TERRACLOR DUST

REGISTRANT *NAME AND ADDRESS*

* 000239 CHEVRON CHEMICAL COMPANY
ORTHO DIVISION 940 HENSLEY WAY
RICHMOND CA 94801

********** PRODUCT NAME **********

**01522* ORTHO LAWN DISEASE CONTROL

**02073* ORTHOCIDE SOIL TREATER X-H

**02162* ORTHO PCNB 80 DUST CONCENTRATE

**02213* ORTHO SOIL TREATER 3 "X"

**02382* ORTHO ORTHOCIDE SOIL TREATER "X"

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

REGISTRANT *NAME AND ADDRESS*

* 000241 AMERICAN CYANAMID COMPANY
BOX 400
PRINCETON NJ 08540

********** PRODUCT NAME **********

**00146* THIMET 10% SYS. INSECT./TERRACLOR SUPER X SOIL FUNGL. GR

REGISTRANT *NAME AND ADDRESS*

* 000279 FMC CORP.
AGRICULTURAL CHEM DIV.
2000 MARKET STREET
PHILADELPHIA, PA. 19103

********** PRODUCT NAME **********

**01250* NIAGARA PCNB 40 DUST CODE: 30260

**02222* NIAGARA PCNB10 ZINEB 10 SOIL TREATER

**02358* NIAGARA LANSTAN 10 PCNB-5 GRANULAR SOIL FUNGICIDE

**02591* TERRACLOR 6.5 SUPER X 1.6 THIMET 6.5 GRANULAR CODE: 31964

**02938* TERRACLOR 6.5 THIMET 6.5 GRANULAR

**02967* TERRACLOR 5 ZINEB 2/5 THIMET 5 COATED GRANULES

**02975* CAPTAN TERRACHLOR 10-10

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

REGISTRANT	*NAME AND ADDRESS*
* 000476	STAUFFER CHEMICAL COMPANY LABELING & REGISTRATION DEPT 1200 SOUTH 47TH ST RICHMOND, CA 94804

********** PRODUCT NAME **********

**01315* STAUFFER CAPTAN TERRACLOR 10-10 SEED PROTECTANT

**01437* TERRACLOR 10 DUST

**01500* CAPTAN-PCNB 10-10 DUST

**01739* TERRACLOR 10 G GRANULES

**01881* CAPTAN-PCNB 10-10 GRANULAR

**01928* CAPTAN TERRACLOR 30-30 WP SEED PROTECTANT

**01977* CAPTAN-TERRACLOR* 30-30 SEED PROTECTANT

REGISTRANT	*NAME AND ADDRESS*
* 000524	MONSANTO COMPANY AGRICULTURAL PRODUCTS 800 N. LINDBERGH BLVD. ST. LOUIS, MO 63166

********** PRODUCT NAME **********

**00121* PCNB 80% DUST CONCENTRATE

**00122* PCNB TECHNICAL GRADE

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

REGISTRANT	*NAME AND ADDRESS*
* 000538	SCOTT O M & SONS COMPANY MARYSVILLE OH 43040

********** PRODUCT NAME **********

**00040* PROTURF FF 11

**00050* FUNGICIDE WITH FERTILIZER FOR BLUEGRASS LAWNS

**00055* SCOTTS FUNGICIDE WITH FERTILIZER FOR ST. AUGUSTINE GRASS LAWNS

**00078* LAWN DISEASE CONTROL

**00096* NEW LAWN DISEASE CONTROL

**00108* PROTURF NEW FF II

**00116* SCOTTS TURF BUILDER PLUS LAWN DISEASE PREVENTER

REGISTRANT	*NAME AND ADDRESS*
* 000550	VAN WATERS & ROGERS DIV OF UNIVAR 2256 JUNCTION AVENUE SAN JOSE, CA 95131

********** PRODUCT NAME **********

**00091* GUARDSMAN SEED GUARD

REGISTRANT *NAME AND ADDRESS*

* 000554 AGSCO INC
BOX 458
GRAND FORKS ND 58201

********** PRODUCT NAME **********

**00110* AGSCO PCNB-E.C.

REGISTRANT *NAME AND ADDRESS*

* 000557 SWIFT AGRICULTURAL CHEMICAL
CORP.
111 WEST JACKSON BOULEVARD
CHICAGO, IL 60604

********** PRODUCT NAME **********

**01856* VIGORO BROWN PATCH CONTROL PLUS FERTILIZER

REGISTRANT *NAME AND ADDRESS*

* 000728 SOUTHLAND PEARSON & COMPANY
PO BOX 7151
MOBILE AL 36601

********** PRODUCT NAME **********

**00081* PEARSONS GREEN LAWN FUNGICIDE

REGISTRANT *NAME AND ADDRESS*

* 000802 LILLY CHAS H COMPANY MILLER RD DIV
7737 N.E. KILLINGSWORTH
PORTLAND, OR 97218

********** PRODUCT NAME **********

**00454* MILLER S TETRACHLOR 20D FUNGICIDE

REGISTRANT *NAME AND ADDRESS*

* 000869 GREEN LIGHT COMPANY
P.O. BOX 17985
SAN ANTONIO, TX 78217

********** PRODUCT NAME **********

**00037* GREEN LIGHT BULB STARTER & FOOD

REGISTRANT *NAME AND ADDRESS*

* 001023 TUCO PRODUCTS COMPANY
DIV UPJOHN CO 7171 PORTAGE RD
KALAMAZOO MI 49001

********** PRODUCT NAME **********

**00010* ACTI DIONE - RZ

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

REGISTRANT *NAME AND ADDRESS*

* 001202 PUREGRO COMPANY
1052 W 6TH ST
LOS ANGELES CA 90017

********** PRODUCT NAME **********

**00105* GAVICIDE THIRET PCNB 6.5-6.5

**00192* PUREGRO TERRACHLOR 20 DUST

**00193* PUREGRO TERRACHLOR 10 GRANULES

**00203* PUREGRO DI SYSTON PCNB 6.5-6.5

REGISTRANT *NAME AND ADDRESS*

* 001258 OLIN CHEMICALS
OLIN CORPORATION
120 LONG RIDGE ROAD
STAMFORD, CT 06904

********** PRODUCT NAME **********

**00156* MATHIESON TERRACLOR 20% DUST

**00185* OLIN TERRACLOR 75% WETTABLE POWDER

**00279* TERRACLOR 2 LB EMULSIFIABLE SOIL FUNGICIDE

**00286* TERRACLOR 40% DUST SOIL FUNGICIDE

**00287* TERRACLOR 10% DUST-SOIL FUNGICIDE

**00407* MATHIESON BRAND TERRACLOR LANDPLASTER MIXTURE

**00466* MATHIESON TERRACAP 10-10-DUST

**00516* MATHIESON TERRACLOR 80% DUST CONCENTRATE

**00517* OLIN TERRACLOR TECHNICAL GRADE PCNB 99% SOIL FUNGICIDE

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

**CONTINUE REGISTRANT 001258

**00555* MATHIESON TERRACLOR 10% GRANULAR

**00584* MATHIESON GREENJACK LAWN FUNGICIDE

**00588* OLIN TURFCIDE EMULSIFIABLE TERRACLOR FUNGICIDE

**00740* OLIN TERRACLOR SUPER-X EMULSIFIABLE SOIL FUNGICIDE

**00758* TERRACLOR SUPER X GRANULAR 10-2.5 SOIL FUNGICIDE

**00759* OLIN TERRACLOR SUPER X DUST-SOIL FUNGICIDE

**00760* OLIN TERRACLOR SUPER X PRE MIX DUST SOIL FUNG TERRACLOR PLUS TERRAZOLE

**00765* TURFCIDE 10% GRANULAR SOIL FUNGICIDE

**00776* TERRACLOR SUP X SOIL FUNG WITH DI SYSTON SYSTEMIC INSECT GRANULAR

**00786* OLIN TERRA-COAT COTTON SEED TREATMENT

**00789* OLIN TERRACLOR SUPER-X SOIL FUNG W/THIMET SYST. INSECT. GRAN

**00801* OLIN TERRACLOR LIQUID SEED TREATMENT FUNGICIDE

**00806* TERRACLOR

**00809* OLIN TERRACLOR 6.5% PLUS DI-SYSTON 6.5% GRANULAR

**00810* OLIN TERRACLOR SUPER-X-MOLY SEED TREATMENT FUNGICIDE

**00811* OLIN TERACLOR 6.5% SOIL FUNGICIDE WITH THIMET SYSTEMIC INSECTICIDE 6.5

**00813* OLIN TERRACLOR SUPER-X-SEED DUST 20-5

**00814* OLIN TERRA-COAT L-41 SEED TREATMENT FUNGICIDE

**00818* OLIN TERRA-COAT L-205

**00819* OLIN TERRA-COAT MP 6015

**00821* OLIN TERRACLOR 90% DUST CONCENTRATE

**00823* OLIN TERRACLOR SOIL FUNGICIDE 30% GRANULAR

**00824* OLIN TERRA COAT MP-4010 WITH MOLY SEED TREATMENT FUNGICIDE

**00830* OLIN-TERR COAT L-105 SEED TREATMENT FUNGICIDE

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

**CONTINUE REGISTRANT 001258

**00882* OLIN-TERRA COAT LT 2 SEED TREATMENT FUNGICIDE

**00884* OLIN-TERRA-COAT SD-205 SEED DUST FUNGICIDE

**00886* OLIN TERRACLOR SUPER-X WITH GRAPHITE SEED TREATMENT FUNGICIDE

**00914* OLIN TERRA-COAT 2-LF SEED TREATMENT FUNGICIDE

**00943* OLIN TERRACLOR SUPER-X 20-5 WITH GRAPHITE

**00944* OLIN TERRA-COAT 205-LF SEED TREATMENT FUNGICIDE

**00964* OLIN-TERRACLOR 20% GRANULAR SOIL FUNGICIDE

**00982* OLIN TERRA-COAT ZN-2055

****

REGISTRANT *NAME AND ADDRESS*

* 001339 COTTON STATES CHEM CO INC
P O DRAWER 157
W MONROE LA 71291

********** PRODUCT NAME **********

**00167* PURSON-ZIC TERRACHLOR EMULSIFIABLE CONCENTRATE

****

REGISTRANT *NAME AND ADDRESS*

* 001926 A G CHEM-CHEM DIST
ARIZONA AGROCHEMICAL CO.
P.O. BOX 21537
PHOENIX AZ 85036

********** PRODUCT NAME **********

**00411* PHOENIX BRAND GRANULAR INSECTICIDE

**00439* PHOENIX BRAND PCNB 10% GRANULAR

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

**CONTINUE REGISTRANT 001526

**00492* PHOENIX BRAND GRANULES CONTAINING THIRET 6.5 PLUS PCNB 6.5

****

REGISTRANT *NAME AND ADDRESS*

* 002169 PATTERSON CHEMICAL COMPANY INC
1400 UNION AVE
KANSAS CITY, MO 64101

********** PRODUCT NAME **********

**00173* PATTERSON'S ROOT AND CROWN ROT CONTROL

****

REGISTRANT *NAME AND ADDRESS*

* 002342 KERR-MCGEE CHEMICAL CORP
MGE PKG & LABELING
KERR-MCGEE CENTER
OKLAHOMA CITY OK 73102

********** PRODUCT NAME **********

**00759* GEO-TONE LAWN FUNGICIDE SPRAY

**00788* 10% THIRAM 10% PCNB

**00836* 20% TERRACHLOR DUST

****

REGISTRANT *NAME AND ADDRESS*

* 002749 ACETC CHEMICAL COMPANY INC
126-02 NORTHERN BLVD
FLUSHING NY 11368

********** PRODUCT NAME **********

**CONTINUE REGISTRANT 002749

**00009* PCNB 100

**00289* CAPTAN PCNB 30-30 FUNGICIDE SEED PROTECTANT

REGISTRANT *NAME AND ADDRESS*

* 002935 WILBUR ELLIS CO.
P. O. BOX 1286
FRESNO, CA 93715

********** PRODUCT NAME **********

**00208* RED-TOP TERRACLOR 2 SPRAY

**00357* RED TOP PCNB 10 GRANULAR

**00361* RED TOP THIMET 6.5% SYST. INSECT W/PCNB 6.5% SOIL FUNG GRAN

**00362* RED TOP DI-SYSTON 6.5% SYST. INSECT. W/PCNB 6.5% SOIL FUNG GRAN

REGISTRANT *NAME AND ADDRESS*

* 003125 CHEMAGRO DIV OF BAYCHEM CORP
BOX 4913
KANSAS CITY MO 64120

********** PRODUCT NAME **********

**00070* DEXON - TERRACLOR 35-35 WETTABLE POWDER

**00109* DEXON-TERRACLOR 5-5 GRANULAR SOIL FUNGICIDE

**00145* DEXON TERRACLOR 2.5%-10% DUST

REGISTRANT *NAME AND ADDRESS*

* 003743 SOUTHERN AGRICULTURAL CHEMICALS INC
PO BOX 527
KINGSTREE SC 29556

********** PRODUCT NAME **********

**00251* 101 BRAND P C N B 75 WETTABLE

**00300* 30-30 PLANTER BOX TREATER

**00303* 10-10 PLANTER BOX TREATER

REGISTRANT *NAME AND ADDRESS*

* 004185 SMITH-DOUGLASS DIV.
BORDEN CHEMICAL, BORDEN INC.
5100 VIRGINIA BEACH BLVD.
NORFOLK, VA 23501

********** PRODUCT NAME **********

**00229* CHAMPION LANDPLASTER WITH TERRACHLOR FOR PEANUTS

REGISTRANT *NAME AND ADDRESS*

* 004581 PENNWALT CORP AGCHEM DIV.
PENNWALT TECHNOLOGICAL CENTER
P.O. BOX C
KING OF PRUSSIA, PA 19406

********** PRODUCT NAME **********

**00260* PCNB TECHNICAL

**00264* PCNB FUNGICIDE

REGISTRANT	*NAME AND ADDRESS*
* 005522	FRYLINK ADRIAN ASSOCIATION BOX 339 BABYLON NY 11702

********** PRODUCT NAME **********

**00001* AAFUMA

REGISTRANT	*NAME AND ADDRESS*
* 005905	HELENA CHEMICAL CO CLARK TOWER, 5100 POPLAR AVE, SUITE 2904 MEMPHIS TN 38137

********** PRODUCT NAME **********

**00310* HELENA 10% TERRACLOR DUST

REGISTRANT	*NAME AND ADDRESS*
* 005967	MOYER CHEMICAL COMPANY BOX 945 SAN JOSE CA 95108

********** PRODUCT NAME **********

**00055* DEXACLOR 35-35

REGISTRANT	*NAME AND ADDRESS*
* 006720	SOUTHERN HILL CREEK PRODUCTS COMPANY INC BOX 1096 TAMPA FL 33601

********** PRODUCT NAME **********

**00075* SHCP TTC TURF FUNGICIDE

REGISTRANT	*NAME AND ADDRESS*
* 007001	OCCIDENTAL CHEMICAL CO P O BOX 198 LATHROP, CA 95330

********** PRODUCT NAME **********

**00068* BEST TERRACLOR 40 DUST

**00175* TERRACLOR 2 EC

REGISTRANT	*NAME AND ADDRESS*
* 007401	VOLUNTARY PURCHASING GROUP INC PO BOX 460 BONHAM TX 75418

********** PRODUCT NAME **********

**00042* FERTI-LOME LAWN & GARDEN FUNGICIDE

**00084* FERTI-LOME LIQUID FUNGICIDE FOR BROWN PATCH CONTROL

**00163* FERTI-LOME AZALEA-CAMELLIS-GARDENIA PROBLEMS SOLVER

**00197* FERTI-LOME CONTAINING FUNGICIDE

REGISTRANT	*NAME AND ADDRESS*
* 008222	LING FUANG INDUSTRIES, INC. LING FUANG, IND. P.O. BOX 1207 GARDNERVILLE, NV. 89410

**** PRODUCT NAME ****

**00021* T & C MULTI-PURPOSE INSECTICIDE-FUNGICIDE

**00023* TCNB & COUNTRY MULTI-PURPOSE SOIL & BULB DUST

REGISTRANT	*NAME AND ADDRESS*
* 008340	AMERICAN AGRICHEM CORPORATION 270 SHEFFIELD STREET MOUNTAINSIDE, NJ 07092

**** PRODUCT NAME ****

**00001* BRASSICOL 20

REGISTRANT	*NAME AND ADDRESS*
* 008434	DOTSON & SONS INC BOX 173 BRAWLEY CA 92227

**** PRODUCT NAME ****

**00033* DOT-SON BRAND STAND -AID

REGISTRANT	*NAME AND ADDRESS*
* 009779	RIVERSIDE CHEM COMPANY P.O. BOX 171199 855 RIDGE LAKE BLVD MEMPHIS TN 38117

**** PRODUCT NAME ****

**00099* RIVERSIDE T-MAN COTTON SEEDLING FUNGICIDE

REGISTRANT	*NAME AND ADDRESS*
* 010226	ROCKWOOD CHEM COMPANY BOX 34 BRAWLEY CA 92227

**** PRODUCT NAME ****

**00005* ROCKWOOD ER SYST T THIMET 6.5% INSECT W/PCNB SOIL FUNG GRAN FOR CO

**00014* ROCKWOOD BRAND LITTLE PEBBLES CONTAINS DI SYSTON 6.5% PCNB 6.5%

**00032* ROCKWOOD BRAND TERRACLOR 2 LB. E.C.

REGISTRANT	*NAME AND ADDRESS*
* 010290	PROFESSIONAL CHEMICAL COMPANY INC P.O. BOX 94071 4517 YALE ST HOUSTON TX 77018

**** PRODUCT NAME ****

**00021* TERRACLOR 2E

REGISTRANT	*NAME AND ADDRESS*
* 010659	OCCIDENTAL CHEMICAL COMPANY BOX 1185 HOUSTON TX 77001

********** PRODUCT NAME **********

**00034* ZIPP LAWNFOOD 6-12-12 FUNGUS CONTROL

REGISTRANT	*NAME AND ADDRESS*
* 010820	QUIMICA ORGANICA DE MEXICO S A C/O RENEE ROMERO & CO, INC 103 ROCKWOOD AVE CALEXICO CA 92231

********** PRODUCT NAME **********

**00001* PCNB TECHNICAL MATERIAL FOR MANUFACTURING PURPOSES ONLY

REGISTRANT	*NAME AND ADDRESS*
* 010912	HAYNES CHEMICAL COMPANY P.O. BOX 30 EAST GRAND FORKS, MN 56721

********** PRODUCT NAME **********

**00001* HAYNES SEED TREAT NO.1

REGISTRANT	*NAME AND ADDRESS*
* 011469	GREEN-UP PLANT FOOD COMPANY PO BOX 9 NACOGDOCHES TX 75961

********** PRODUCT NAME **********

**00001* GREEN-UP LAWN-GARD PLANT FOOD

REGISTRANT	*NAME AND ADDRESS*
* 011656	WESTERN FARM SERVICE INC SHELL CHEM COMPANY 1025 CONNECTICUT AVE-STE 200 WASH DC 20036

********** PRODUCT NAME **********

**00029* TERRACLOR* THIRET(R) 6.5 - 6.5

REGISTRANT	*NAME AND ADDRESS*
* 018773	TURNER SALES & SUPPLY INC PO BOX 847 TIFTON GA 31794

********** PRODUCT NAME **********

**00002* T-S-P 4 WAY FOR SEED DISEASE CONTROL

09/21/77 FEDERALLY REGISTERED PRODUCTS CONTAINING PCNB

REGISTRANT	*NAME AND ADDRESS*
* 033955	ACME DIVISION PBI GORDON CORP 300 SOUTH THIRD ST KANSAS CITY, KS 66118

********** PRODUCT NAME **********	
**00518*	ACME BULB SAVER

09/21/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING PCNB

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REGISTRANT *NAME AND ADDRESS*

* 000239 CHEVRON CHEMICAL COMPANY
ORTHO DIVISION 940 HENSLEY WAY
RICHMOND CA 94801

********** PRODUCT NAME **********

**05845* ORTHOCIDE SOIL TREATER "X"

**08631* ORTHOCIDE PCNB 10-20 DUST

****

REGISTRANT *NAME AND ADDRESS*

* 000279 FMC CORP.
AGRICULTURAL CHEM DIV.
2000 MARKET STREET
PHILADELPHIA, PA. 19103

********** PRODUCT NAME **********

**04970* PCNB 20 DUST

**04971* PCNB 10 ZINEB 10 SOIL TREATER

**09451* PCNB 5% IN FERTILIZER

****

REGISTRANT *NAME AND ADDRESS*

* 000557 SWIFT AGRICULTURAL CHEMICAL
CORP.
111 WEST JACKSON BOULEVARD
CHICAGO, IL 60604

********** PRODUCT NAME **********

**09673* PAR EX PLUS PCNB

**09674* PAR EX PLUS PCNB

09/21/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING PCNB

**CONTINUE REGISTRANT 000557

**09675* PAR EX PLUS PCNB

**09676* PAR EX PLUS PCNB

**09731* PAR EX PLUS PCNB

**09732* PAR EX PLUS PCNB

**09733* PAR EX PLUS PCNB

**09734* PAR EX PLUS PCNB

**09735* PAR EX PLUS PCNB

**09736* PAR EX PLUS PCNB

**09737* PAR EX PLUS PCNB

**09738* PAR EX PLUS PCNB

**09739* PAR EX PLUS PCNB

**09740* PAR EX PLUS PCNB

**09741* PAR EX PLUS PCNB

**09742* PAR EX PLUS PCNB

**09743* PAR EX PLUS PCNB

**09744* PAR EX PLUS PCNB

**09745* PAR EX PLUS PCNB

**09746* PAR EX PLUS PCNB

**09747* PAR EX PLUS PCNB

**09748* PAR EX PLUS PCNB

**09749* PAR EX PLUS PCNB

**09750* PAR EX PLUS PCNB

**09751* PAR EX PLUS PCNB

**09752* PAR EX PLUS PCNB

09/21/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING PCNB

**CONTINUE REGISTRANT 000557

**09753* PAR EX PLUS PCNB

**09754* PAR EX PLUS PCNB

**09755* PAR EX PLUS PCNB

**09756* PAR EX PLUS PCNB

REGISTRANT *NAME AND ADDRESS*

* 000829 SOUTHERN AGRI INSECT INC
PO BOX 218
PALMETTO FL 33561

********** PRODUCT NAME **********

**09449* SA-50 BRAND TURF - TREATER FUNGICIDE

**09450* SA-50 BRAND TERRACHLOR SUPER -X

REGISTRANT *NAME AND ADDRESS*

* 000909 COOKE LABORATORY PRODUCTS
4759 S DURFEE AVE
PICO RIVERA CA 90660

********** PRODUCT NAME **********

**08642* COOKE FUNGICIDE

**08644* ROSEDALE'S FUNGI-TAC

09/21/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING PCNB

REGISTRANT *NAME AND ADDRESS*

* 001202 PUREGRO COMPANY
1052 W 6TH ST
LOS ANGELES CA 90017

********** PRODUCT NAME **********

**05009* PUREGRO TERRACIOR 2 E

**05033* PUREGRO TERRACHLOR SUPER X DISYSTON 6.5-1.63.5

**05034* PUREGRO TERRACHLOR SUPER X THIMET 6.5-1.63.5

**05035* PUREGRO THIMET PCNB 6.5-6.5 GRAN

**05061* PUREGRO DI-SYSTON PCNB 6.5-6.5

REGISTRANT *NAME AND ADDRESS*

* 001258 OLIN CHEMICALS
OLIN CORPORATION
120 LONG RIDGE ROAD
STAMFORD, CT 06904

********** PRODUCT NAME **********

**08634* TERRACLOR R 2-16 EMULSIFIABLE

**08635* TERRACLOR R 10% GRANULAR

**08636* TERRACLOR R 2-16 EMULSIFIABLE

**08638* TERRACLOR R + DASANIT R 10-30 GRANULAR

**08639* TERRACLOR R + DASANIT R 10-30 GRANULAR

**08640* TERRACLOR R + DASANIT 10-3 GRANULAR

REGISTRANT *NAME AND ADDRESS*

* 001526 A G CHEM-CHEM DIST
ARIZONA AGROCHEMICAL CO.
P.O. BOX 21537
PHOENIX AZ 85036

********** PRODUCT NAME **********

**03787* AGRO-CHEM BRAND TERRACLOR 10 GRANULAR

**03788* AGRO-CHEM BRAND TERRACLOR 2E

REGISTRANT *NAME AND ADDRESS*

* 001871 FARMCRAFT, INC
8900 S W COMMERCIAL
TIGARD OR 97223

********** PRODUCT NAME **********

**08921* FARMCRAFT TERRACHLOR 20 DUST

REGISTRANT *NAME AND ADDRESS*

* 002224 MOBIL CHEMICAL COMPANY INDUSTRIAL CHEMICALS DIV
P O BOX 29
KINGSTREE, SC 29556

********** PRODUCT NAME **********

**08632* MOCAP(NEMATICIDE-INSECTICIDE)-PCNB 3-10 GRANULAR

**08633* MOCAP (NEMATICIDE-INSECTICIDE)-PCNB 3-10 GRANULAR

REGISTRANT *NAME AND ADDRESS*

* 002342 KERR-MCGEE CHEMICAL CORP
MGR PKG & LABELING
KERR-MCGEE CENTER
OKLAHOMA CITY OK 73102

********** PRODUCT NAME **********

**06962* GRO-TONE GRANULAR LAWN FUNGICIDE

REGISTRANT *NAME AND ADDRESS*

* 002935 WILBUR ELLIS CO.
P. O. BOX 1286
FRESNO, CA 93715

********** PRODUCT NAME **********

**06625* RED-TOP PCNB SEED-COAT

06634* RED-TOP SACTO-SUPER X * 6.5-6.5-1.63 GRANULAR

06635* RED-TOP THIMET-SUPER X * 6.5-6.5-1.63 GRANULAR

**06654* RED-TOP PCNB 10 DUST

REGISTRANT *NAME AND ADDRESS*

* 003122 SUPERIOR FERTILIZER & CHEM COMPANY ATTN R NASH
BOX 1021
TAMPA FL 33600

********** PRODUCT NAME **********

**07192* SUPERIOR'S EXTRA VALUE TERRACLOR 2-EC

**07565* SUPERIOR'S SOIL FUNGICIDE

REGISTRANT *NAME AND ADDRESS*

* 003238 AGRICO CHEMICAL CO.
CROP PROTECTION CHEMICAL DIV.
BOX 3451
TULSA, OK 74101

********** PRODUCT NAME **********

**10165* STANDARD BRAND LAWN & TURF FUNGICIDE

**10166* STANDARD FORMAD LAWN & TURF FUNGICIDE

REGISTRANT *NAME AND ADDRESS*

* 005967 MOYER CHEMICAL COMPANY
BOX 945
SAN JOSE CA 95108

********** PRODUCT NAME **********

**08641* TERRACLOR DUST NO. 20

REGISTRANT *NAME AND ADDRESS*

* 006720 SOUTHERN HILL CREEK PRODUCTS COMPANY INC
BOX 1096
TAMPA FL 33601

********** PRODUCT NAME **********

**03357* SHCP TERRACLOR 2-E

REGISTRANT *NAME AND ADDRESS*

* 006973 SOILSERV INC
PO BOX 1817
SALINAS CA 93901

********** PRODUCT NAME **********

**04969* SOILSERV TERRACLOR EC 25

REGISTRANT *NAME AND ADDRESS*

* 007159 DOWNEY FERTILIZER COMPANY
BOX 370 9447 E IMPERIAL HIGHWAY
DOWNEY CA 90242

********** PRODUCT NAME **********

**08219* RED STAR VELVET TERRACAP

REGISTRANT *NAME AND ADDRESS*

* 007413 PENNINGTON GRAIN & SEED INC
PO BOX 290
MADISON GA 30650

********** PRODUCT NAME **********

**10284* PENNINGTON GREEN COAT FOR GRASS TREATMENT

REGISTRANT	*NAME AND ADDRESS*
* 007478	CHEM PAK COMPANY P.O. BOX 430757 SOUTH MIAMI FL 33157

********** PRODUCT NAME **********
**08028* CURE-A-LAWN

REGISTRANT	*NAME AND ADDRESS*
* 008278	METRO BIOLOGICAL LAB 8241 GAY ST CYPRESS CA 90639

********** PRODUCT NAME **********
**10167* METRO DITHANE M-45

REGISTRANT	*NAME AND ADDRESS*
* 008434	DOTSON & SONS INC BOX 173 BRAWLEY CA 92227

********** PRODUCT NAME **********
**07052* DOT-SOT BRAND STAND-AID
**07053* DOT-SON BRAND THIRET STAND-AID
**07054* DOT-SON BRAND TERRACLOR SOIL FUNGICIDE 10% GRANULAR
**08976* DOT-SON BRAND TERRACLOR 20%

REGISTRANT	*NAME AND ADDRESS*
* 009404	CHASE & COMPANY BOX 1697 SANFORD FL 32771

********** PRODUCT NAME **********
**03483* SUNNILAND THREE WAY FUNGICIDE FILE SYMBOL: 9404-EI

REGISTRANT	*NAME AND ADDRESS*
* 009782	WOODBURY CHEMICAL COMPANY PO BOX 4319 PRINCETON FL 33030

********** PRODUCT NAME **********
**03664* TERRACLOR 2-E
**03665* TERRACLOR 75-W
**03670* TRI-MIX FUNGICIDE

REGISTRANT	*NAME AND ADDRESS*
* 010226	ROCKWOOD CHEM COMPANY BOX 34 BRAWLEY CA 92217

********** PRODUCT NAME **********
**03784* ROCKWOOD BRAND SISTEMIC T

REGISTRANT *NAME AND ADDRESS*

* 010258 SPRAY DISTRIBUTORS, INC.
11625 MC BEAN DR.
EL MONTE, CA 91732

********** PRODUCT NAME **********

**08637* TERRACLOR R 2-16 EMULSIFIABLE

REGISTRANT *NAME AND ADDRESS*

* 010965 CALIFORNIA DEPT OF AGRICULTURE
WEED & VERTEBRATE PEST CONTROL 1220 N ST
SACRAMENTO CA 95814

********** PRODUCT NAME **********

**09904* ANY APPROPRIATE PRODUCT

REGISTRANT *NAME AND ADDRESS*

* 010972 CASTLE A L INC
PO BOX 877
MORGAN HILL CA 95037

********** PRODUCT NAME **********

**06550* CASTLE BRAND DUST FUNGI CLOR 20

**10158* CASTLE BRAND DUST FUNGI CLOR 40

**10159* CASTLEW BRAND FUNGI CLOR 75W

REGISTRANT *NAME AND ADDRESS*

* 011017 FOSTER-GARDNER INC
1577-1ST ST
COACHELLA CA 92236

********** PRODUCT NAME **********

**08196* TERRACLOR 2 E

REGISTRANT *NAME AND ADDRESS*

* 011079 LESCO SEED & CHEMICAL INC
PO BOX 148
WATSONVILLE CA 95076

********** PRODUCT NAME **********

**07055* LESCO TERRACLOR 80% DUST

REGISTRANT *NAME AND ADDRESS*

* 011093 MASTER NURSERYMEN'S ASSN C/O LEO DUPUICH
3620 1/2 MT DIABLO BLVD
LAFAYETTE CA 94549

********** PRODUCT NAME **********

**07371* 49'ER BRAND FUNGICID

REGISTRANT *NAME AND ADDRESS*

* 011656 WESTERN FARM SERVICE INC SHELL CHEM COMPANY
1025 CONNECTICUT AVE-STE 200
WASH DC 20036

********** PRODUCT NAME **********

**05918* TERRACHLOR SUPER X THIMET 5-1.25-5 GRANULAR

REGISTRANT *NAME AND ADDRESS*

* 014775 ASGROW FLORIDA COMPANY
PO DRAWER I
PLANT CITY FL 33566

********** PRODUCT NAME **********

**08724* PROTECTURF WETTABLE

REGISTRANT *NAME AND ADDRESS*

* 021275 SPAULDING INC
1921 5TH AVE S
ST PETERSBURG FL 33733

********** PRODUCT NAME **********

**05364* X-CEL TERRACLOR 2E

**05547* X-CEL TTC

REGISTRANT *NAME AND ADDRESS*

* 023420 INDEPENDENCE ANIMAL HOSPITAL
INDEPENDENCE KS

********** PRODUCT NAME **********

**06946* FASCO TERRACLOR 2 E.C.

REGISTRANT *NAME AND ADDRESS*

* 035222 SOUTHERN CHEMICALS, INC.
204 N. ELM AVE, BOX 1480
SANFORD, FL 32771

********** PRODUCT NAME **********

**07175* TURF FUNGICIDE

REGISTRANT *NAME AND ADDRESS*

* 035994 BOB BOYDSTON PEST CONTROL
1419 N. BIG SPRING STREET
MIDLAND, TX 79701

********** PRODUCT NAME **********

**06087* BOYDSTON'S CONC.SHRUB AND FLOWER SPRAY

**** PRODUCT SEARCH LISTING **** PAGE 15

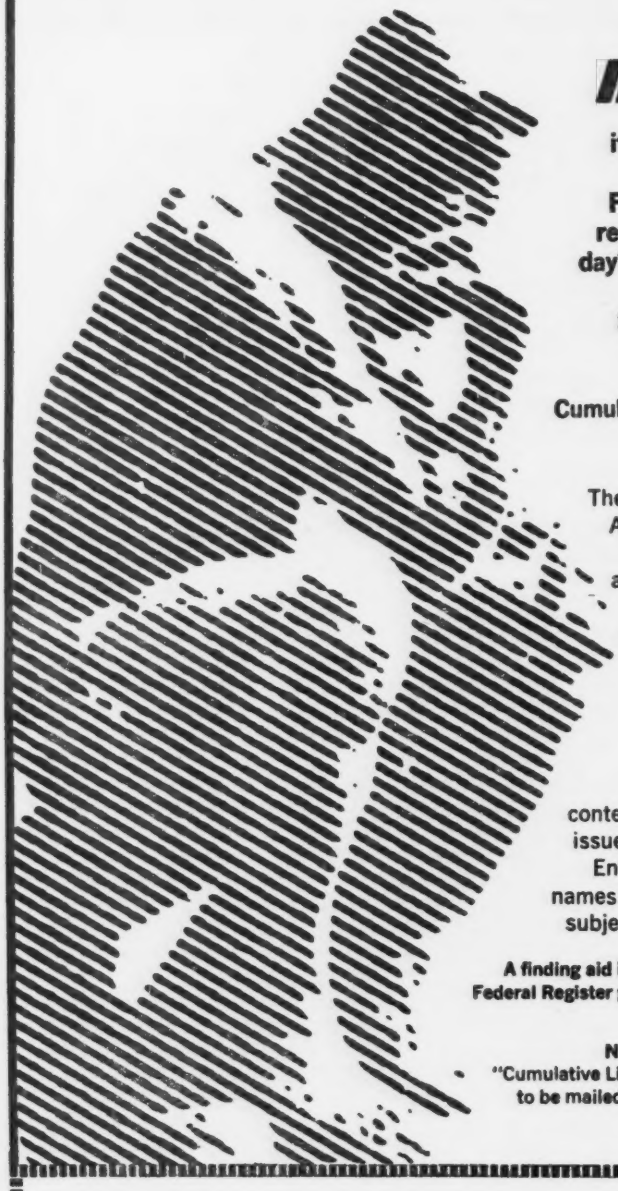
09/21/77 APPLICANTS FOR REGISTRATION OF PRODUCTS CONTAINING PCNB

REGISTRANT	*NAME AND ADDRESS*	
* 037854	AGRICULTURAL SUPPLIES OF BOX 6 BATESVILLE, TX 78829	BATESVILLE, INC.

********** PRODUCT NAME **********

**08298* FALL OUT 10% TERRACLOR DUST

[FR Doc.77-30279 Filed 10-19-77;8:45 am]



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